Amendments to the Claims

This listing of claims will replace all prior versions and listing of claims in this application.

Listing of claims:

Claims 1-20 (Cancelled)

21. (Currently Amended) A metallocene catalyst system for producing a polyolefin having a molecular weight distribution of from 7 to 20 comprising:

(a) a first constituent comprising a bridged hafnocene-based catalyst component having at least one cyclopentadienyl group effective for producing a high molecular weight fraction, based on a weight average molecular weight of the polyolefin, and wherein the hafnocene-based catalyst component has a structure according to formula II:

$$R''(CpR_n)_g Hf X Q_{3-g} \qquad (II)$$

wherein:

each Cp is a substituted or unsubstituted cyclopentadienyl ring;

each R is the same or different and is hydrogen or a hydrocarbyl radical containing from 1-20 carbon atoms or 2 carbon atoms are joined together to form a $C_4 - C_6$ ring;

R" is a structural bridge between two Cp rings;

Q is a hydrocarbyl radical having from 1-20 carbon atoms, a hydrocarbyloxy radical having from 1-20 carbon atoms or a halogen and can be the same or different from each other;

n is 1, 2, or 4;

g is ~~1 or~~ 2; and

X is a hetero atom ligand ~~with one or two lone pair electrons and selected from the elements in the group VA or VIA of the Periodic Table of Elements and~~ wherein the hetero atom ~~in X~~ is nitrogen, phosphorus, oxygen or sulfur;

(b) a second constituent comprising at least one metallocene or post-metallocene component different from component (a) and effective for producing a low molecular weight fraction, based on a weight average molecular weight, of

the polyolefin and wherein the metallocene catalyst component is an unbridged zirconocene substituted with at least one bulky substituent and the post-metallocene catalyst component is an iron complex of a 2,6-bis(imino)pyridyl ligand; and

(c) an activating agent having a low or no coordinating capability and selected from the group consisting of a borate, a ~~boronate~~borane or an aluminate.

22. (Canceled)

23. (Previously Presented) The metallocene catalyst system of claim 21 wherein the hafnocene-based component has no more than two substituents on each cyclopentadienyl.

24. (Previously Presented) The metallocene catalyst system of claim 21 wherein the hafnocene-based component comprises:

(a) at least one cyclopentadienyl-type group having at least one non-hydrogen substituent at the 3 or 5 position; or

(b) at least one fluorenyl-type group having at least one non-hydrogen substituent at the 3 or 6 position; or

(c) at least one indenyl-type group having at least one non-hydrogen substituent at the 2 or 4 position.

25. (Previously Presented) The metallocene catalyst component of claim 24 wherein said hafnocene-based component comprises:

(a) at least one cyclopentadienyl-type group having two substituents at the 3 and 5 positions; or

(b) at least one fluorenyl-type group having two substituents at the 3 and 6 positions; or

(c) at least one indenyl-type group having two substituents at the 2 and 4 positions.

26. (Previously Presented) The metallocene catalyst system of claim 24 wherein the bridge in the hafnocene-based catalyst component is an ethylene or dimethylsilyl group.

27. (Previously Presented) The metallocene catalyst system of claim 26 wherein Q in the hafnocene-based catalyst component is chlorine.

28. (Canceled)

29. (Canceled) The metallocene catalyst system of claim 28 wherein the second constituent comprises a metallocene catalyst component based on zirconium.

30. (Canceled) The metallocene catalyst system of claim 29 wherein the metallocene catalyst component is substituted with at least one bulky substituent.

31. (Canceled)

32. (Previously Presented) The metallocene catalyst of claim 21 further comprising a co-catalyst.

33. (Previously Presented) The metallocene catalyst system of claim 32 wherein said co-catalyst is an aluminum alkyl.

34. (Previously Presented) The metallocene catalyst system of claim 21 further comprising an inert inorganic support.

35. (Previously Presented) The metallocene catalyst system of claim 34 wherein the inorganic support is silica having a specific surface area within the range of 200-700 m2/g and a pore volume within the range of 0.5-3 ml/g.

36. (Previously Presented) The metallocene catalyst system of claim 21 wherein said first constituent is present in an amount within the range of 10-90 wt.% of the composite amount of said first constituent and said second constituent.

37. (Previously Presented) The metallocene catalyst system of claim 36 wherein said first constituent is present in an amount of no more than 50 wt.% of the composite amount of said first and second constituents.

38. (Previously Presented) The metallocene catalyst system of claim 36 wherein said first constituent is present in an amount within the range of 35-49 wt.% of the composite amount of said first and second constituents.

39. (Currently Amended) A process for the polymerization of an olefin comprising:

(a) providing a metallocene catalyst system for producing a polyolefin having a molecular weight distribution of from 7 to 20 comprising:

(1) a first constituent comprising a bridged hafnocene-based catalyst component having at least one cyclopentadienyl group effective for producing a high molecular weight fraction, based on a weight average molecular weight of the polyolefin, and wherein the hafnocene-based catalyst component has a structure according to formula II:

$$R''(CpR_n)_g Hf X Q_{3-g} \qquad (II)$$

wherein:

each Cp is a substituted or unsubstituted cyclopentadienyl ring;

each R is the same or different and is hydrogen or a hydrocarbyl radical containing from 1-20 carbon atoms or 2 carbon atoms are joined together to form a $C_4 - C_6$ ring;

R" is a structural bridge between two Cp rings;

Q is a hydrocarbyl radical having from 1-20 carbon atoms, a hydrocarbyloxy radical having from 1-20 carbon atoms or a halogen and can be the same or different from each other;

n is 1, 2, or 4;

g is ~~1 or~~ 2; and

X is a hetero atom ligand ~~with one or two lone pair electrons and selected from the elements in the group VA or VIA of the Periodic Table of Elements and~~ wherein the hetero atom ~~in X~~ is nitrogen, phosphorus, oxygen or sulfur;[[;]]

(2) a second constituent comprising at least one metallocene or post-metallocene component different from said first constituent and effective for producing a low molecular weight fraction, based on a weight average molecular weight, of the polyolefin and wherein the metallocene catalyst component is an unbridged zirconocene substituted with at least one bulky substituent and the post-metallocene catalyst component is an iron complex of a 2,6-bis(imino)pyridyl ligand;

(3) an activating agent having a low or no coordinating capability and selected from the group consisting of a borate, a ~~boronate~~borane or an aluminate;

(b) introducing an olefin monomer and said metallocene catalyst system into a polymerization reaction zone;

(c) maintaining said reaction zone under polymerization conditions and polymerizing said olefin monomer to produce a polymer of said monomer having a high molecular weight fraction and a low molecular weight fraction; and

(d) extracting said polymer having said high molecular weight and low molecular weight fractions from said polymerization reaction zone.

40. (Previously Presented) The process of claim 39 wherein said olefin is selected from the group consisting of ethylene and propylene and the polymer recovered from said reaction zone comprises at least one of an ethylene or propylene polymer.

41. (Previously Presented) The process of claim 39 wherein the weight average molecular weight of the high molecular weight fraction is from 5-15 times greater than the weight average molecular weight of said low molecular weight fraction.